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(54) Double-glazed panel

(57) Double-glazed panel comprising a support part (A) formed by a frame (3) and a window pane part (B) formed by two window panes (V1, V2) held at a distance from each other by spacer means (5b) that form a unit with the frame (3) and fastened to the latter by gluing and characterized in that the adhesive used to fasten the window panes (V1, V2) to the spacer means (5b) has a rigidity modulus within a range of values from about 20 MPa to 100 MPa and a shear resistance greater than 10 MPa, in such a way as to produce a panel in which the window panes (V1, V2) contribute to the rigidity of the panel.

[see source for figure 3]

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Description

[0001] The invention concerns a double glazed panel.

[0002] In the area of construction, more and more windows and picture windows are being equipped with double glazed panels, which simultaneously ensure proper thermal insulation and better sound insulation.

[0003] In a general way, windows and picture windows comprise a part that opens called the opening part and a fixed part called the frame, which makes it possible to mount the assembly to a building.

[0004] The opening part is made up of a frame of wood, aluminum, or plastic material and of a glass pane, which ensures the functions of vision and lighting.

[0005] The role of the frame is to make it possible to put in place systems for locking the opening part on the frame but also to ensure the function of resistance of the assembly, in particular to pressures of the wind that act on the window.

[0006] More and more often, the window is a sealed double pane, which is held in the frame by means of joints that ensure a type of simple bond between the pane and the frame. In addition, the double glazing itself is made up of an insert or spacer, generally of aluminum, on which the two window panes are glued on both sides, all of the above being sealed on the edges by a product that ensures sealing against water vapor.

[0007] First of all, it is confirmed that the manufacturing of these panels involves a significant number of parts. This results in operations of preassembly, assembly, and fastening during the manufacturing, which are long, complicated, and delicate to carry out, in particular in the case of panels of large dimensions. Thus, all of this is cannot be handled well by manufacturing and assembly techniques that remain manual.

[0008] A simplification of these panels may consist of using the frame to form the spacers, as is known from the document DE-2 041 038.

[0009] In addition, it is confirmed that the frame is conceived in such a way as to be able to support, by itself, pressures due to the wind on the opening part assembly, in that its thickness and the quantity of material used increases with the dimensions of the frame and according to the type of material used it may prove necessary to provide means of reinforcement to increase its stiffness, which leads to an implementation of oversized structural shapes with relatively significant cross sections.

[0010] One goal of the invention is to design panes with double glazing having a lighter structure to simultaneously simplify the manufacturing and assembly operations on one hand, and having mechanical characteristics that are clearly improved without having to use additional means, on the other.

[0011] For this purpose, the invention suggests a double glazed panel comprising a support part formed of a frame and window pane part formed of two window panes which are kept at a distance from each other by a spacer means forming a unit with the frame and fastened to the latter by gluing, this panel being characterized in that adhesive used to fasten the window panes on the spacer means has a rigidity modulus within a range of values from about 20 MPa to 100 MPa and a resistance to shear greater than 10 MPa in such a way as to be able to produce a panel where the window panes contribute to the rigidity of the panel.

[0012] Thus, the adhesive used is chosen as a function of its mechanical properties in such a way as to allow transmission of stresses between the window panes and the frame to create an assembly with sandwich effect in which each of the components contributes best to the rigidity of the panel with its own characteristics.

[0013] The choice of the adhesive is also a function of the material used to produce this panel frame, it being known that this material must above all have very good thermal insulation properties like PVC or polypropylene, for example, the latter material also having the advantage of being very interesting from the economic point of view.

[0014] However, the use of polypropylene poses a problem since it is known that few adhesives adhere to this material.

[0015] Thus, according to the invention and after several experiments, it has been found that the adhesives chosen from the polyurethane family and having the mechanical characteristics mentioned above adhere completely to polypropylene, it being known that these adhesives are also satisfactory for materials other than polypropylene.

[0016] As a variation, this problem of adhesion in the case of polypropylene may also be resolved using an adhesive produced with a base of this same material.

[0017] Advantageously, the frame of the panel and the spacer means between the two window panes are integrated with each other so that they form only a single piece manufactured by extrusion.

[0018] According to an example embodiment, each structural shape of the frame has a core with a cross section that is rectangular overall and a central rib with cross section that is also rectangular overall which is mounted to one of the faces of the core to form a part of the spacer means connected with the structural shape, the central rib of each structural shape presenting two parallel longitudinal faces that are separated from each other by a distance corresponding to the size of the desired insulating air cushion.

[0019] Once the structural shapes are assembled to form the frame of the panel, the central ribs of these structural shapes delimit two contact surfaces which surround the frame and on which the two window panes are mounted and glued.

[0020] Finally, the panel is completed with covering and/or decoration means which can be either directly integrated with the structural shapes of the frame or, preferably,

mounted by locking or gluing.

[0021] A double glazed panel according to the invention has numerous advantages, among which the following can especially be cited:

- a frame with more lightweight structure that is obtained by means of an adhesive which allows the window panes to contribute to the rigidity of the panel and to optimize the quantities of material used to produce the frame, this being accomplished without reinforcement of any type, on one hand, and without oversizing of the thicknesses of the frame with increase of its dimensions, on the other,
- the more lightweight structure of the frame makes it possible, for a panel with equivalent surface area, to obtain a larger glazed surface and thus better lighting, and
- manufacturing and assembly operations that are simplified.

[0022] Other advantages, characteristics, and details will be found in the further information included in the description that follows, with reference to the attached drawings, which are given solely by way of example and in which:

- Figure 1 is a partial cross section view of a double glazed panel according to the prior art,
- Figure 2 is a partial cross section view of a first embodiment of a double glazed panel according to the invention,
- Figure 3 is a partial cross section view of a second embodiment of a double glazed panel according to the invention,
- Figure 4 is a partial perspective view of a double glazed panel according to the invention to form an opening part of the window,
- Figure 5 is a bottom view of a structural shape that forms one element of the frame of a double glazed panel according to the invention and
- Figure 6 is a partial cross section view of a variation of the second embodiment illustrated in Figure 3.

[0023] Double glazed panel 1 shown in Figure 1 illustrates the prior art, which has been referred to in the preamble.

[0024] Panel 1 comprises a support part that is made up of a frame 3 formed using the assembly of four rectilinear structural shapes 5, namely: a lower cross beam, an upper cross beam, and two posts. Figure 1 is a cross section of the lower cross beam of frame 3.

[0025] Panel 1 comprises a window pane part made up of two window panes V1 and V2, which are parallel and mounted across from each other. The two window panes V1 and V2 are held so that they are at a distance from each other by means of a metallic spacer 7 which surrounds the frame 3 to form an insulating cushion of air 9. The spacer means 7 is produced using structural shapes with e.g. rectangular cross section. A first putty seal 11 is inserted between the spacer means 7 and the window panes V1 and V2 to ensure sealing, which makes it possible to insulate the cushion of insulating air 9, and a second putty seal 13 is mounted between the window panes V1 and V2 around the spacer means 7 to seal the assembly in a precarious manner before being mounted in frame 3, which is not without problems during transportation and handling.

[0026] Each structural shape 5 comprises a hollow core 5a with a cross section that is rectangular overall of which one face presents a projecting longitudinal wall 5b that forms a contact surface for the window pane V1 or the external window pane.

[0027] The window pane part is put in place on the inside of the frame 3 and positioned using wedges 15. Then the contact and blocking elements 17 or the cover strips are mounted by locking them around frame 3 and across from the longitudinal walls 5b of the structural shapes in order to form a contact surface for the window pane V2 or interior window pane and immobilize the window panes V1 and V2 in the frame 3.

[0028] Seals 18 are inserted between the external window pane V1 and the longitudinal walls 5b of the structural shapes 5 of the frame 3 on one hand, and between the interior glass pane V2 and the blocking cover strips 17 on the other. In the case of panels with large dimensions, a reinforcement structural shape 19 is sometimes mounted on the inside of the lower cross beam 5 to prevent sagging of the core 5a under the weight of window panes V1 and V2.

[0029] The frame 3 of such a panel 1 is manufactured of aluminum or of PVC, for example, and when the panel 1 is intended to form a window opening, the cores 5a of the structural shapes 5 that make up the posts of the frame 3 are equipped with appropriate hardware including the opening/closing mechanism, the hinges, etc.

[0030] A panel 1 according to the invention also comprises a support part and a window pane part, but their assembly is carried out in a different way.

[0031] According to the two embodiments illustrated in Figures 2 and 3, the support part of the panel 1 is also produced using the assembly of the structural shapes 5 to form a frame 3.

[0032] Each structural shape 5 presents a cross section that is in a T shape overall with a central hollow core 5a with cross section that is essentially rectangular with four faces and a hollow central rib 5b mounted on one face of the core 5a that extends over the entire length of same.

[0033] The central rib 5b of each structural shape 5 presents two longitudinal faces separated from each other by a distance corresponding to the space desired to create an insulating cushion of air 9 between the two window panes V1 and V2.

[0034] In concrete terms, once the four structural shapes 5 of the panel 1 are assembled to form the frame 3, the longitudinal faces of the central ribs 5b

of the structural shapes 5 form two contact surfaces on which the two window panes V1 and V2 can be mounted and fastened using an adhesive 20.

[0035] As has been explained in the preamble, this glue 20 is essentially chosen as a function of its mechanical properties.

[0036] In a general manner, the invention recommends the use of an adhesive that has a rigidity modulus and a resistance to shear which are like that of the frame, the adhesives and the window panes may constitute a structural assembly having rigidity, in which the window panes V1 and V2 contribute to this rigidity.

[0037] Numerous experiments have shown that it is necessary to arrive at a compromise such as:

- the value of the rigidity modulus E must preferably be within a range of values from 10 MPa to 100 Mpa, and
- the value of the resistance to shear must be preferably greater than 10 MPa.

[0038] In fact, if the rigidity modulus E is too low, the adhesive will not be rigid enough and this will involve too great a deformation of the frame when wind pressure on window panes V1 and V2 is relatively high. In contrast, if the rigidity modulus E is too high, which is the case with adhesives from the epoxy family, for example, the adhesive is too rigid and cannot support the differences in thermal expansion between the window panes and the frame.

[0039] The structural shapes 5 of the frame 3 can be produced of a thermoplastic material such as PVC or advantageously of polypropylene loaded with glass fibers or of a duroplastic material and manufactured continuously by extrusion or pultrusion, it being known that the material used must have good thermal insulation properties.

[0040] The use of polypropylene is advantageous on the economic level and, in this case, numerous experiments have led to the recommendation of an adhesive chosen from the polyurethane family and having the mechanical characteristics mentioned above.

[0041] In a general manner, when a polyurethane adhesive is chosen, it is also necessary to form a sealing barrier to prevent water vapor from penetrating to the inside of the insulating cushion of air 9. This seal integrity is ensured by the deposit of a butyl rubber putty 22, which is e.g. inserted between the base of the ribs 5b and the window panes V1 and V2.

[0042] As a variation, still considering the case of a frame of polypropylene, it would be possible to use an adhesive with a cross-linkable polypropylene base which makes it possible to simultaneously ensure the fastening of the window panes V1 and V2 to the frame 3 and the insulation of the insulating cushion of air 9, which would eliminate the need for the sealing putty 22.

[0043] In addition, to promote the adhesion of the adhesive on the polypropylene, it is possible to plan a prior surface treatment of the corona or plasma type, for example, or to deposit a primer-type film to increase the surface energy of the frame.

[0044] Numerous experiments have also led to the recommendation of placement of a bead of adhesive 20 having a thickness on the order of 1 to 2 mm and with a width on the order of a centimeter.

[0045] In a general way, once the window panes V1 and V2 have been assembled in the frame 3, a panel 1 is obtained which is completed by trim 25 which gives it an aesthetic appearance, it being known that the functional characteristics of the panel are entirely separate from the aesthetic appearance.

[0046] According to the embodiment illustrated in Figure 2, this trim 25 is integrated with the structural shapes 5 of the frame 3 and made up of two longitudinal flanges 26 which surround the central rib 5b of each structural shape 5. However, this perfectly acceptable solution does not facilitate the gluing operations for the window panes V1 and V2.

[0047] In addition, frame 3 cannot be assembled before window panes V1 and V2 are mounted. In concrete terms, the structural shapes 5 of the frame 3 are mounted in succession on the window frames V1 and V2, which necessitates precise assembly to avoid discontinuity in the joining zones between the consecutive two structural shapes. However, this problem of attachment of structural shapes 5 of the frame 3 can be resolved by mounting a cover at each angle of the frame 3.

[0048] In contrast, according to the embodiment shown in Figure 3, the two longitudinal flanges 26 are separate and connect to each other by elastic locking on the two opposite longitudinal faces of each structural shape 5 once the window panes V1 and V2 have been glued. The locking can be obtained by means of tabs 28 having complimentary shapes.

[0049] This embodiment is more advantageous since the frame 3 can be assembled before the mounting of the window panes V1 and V2. In concrete terms, the structural shapes 5 of the frame 3 are assembled and a soldering operation is then carried out at the level of the joining zones between two consecutive structural shapes to keep them together. Soldering is carried out, for example, using ultrasound.

[0050] Figure 4 shows an example of a panel 1 made up of a window opening part mounted, so that it pivots, on the frame part D of a wall. For this purpose, the hinges C are mounted on a post of the frame 3 and the opening/closing mechanism (not shown) is mounted in the other post, this mechanism being received in part on the inside of the hollow core 5a of the structural shape 5 forming this post.

[0051] In Figure 5, a structural shape 5 of the frame 3 has been shown to illustrate other characteristics of the panel 1 according to the invention.

[0052] In a general manner, following the gluing of the two window panes V1 and V2 on the frame 3, a thermal expansion problem may exist between the glass of the window panes and the material of the frame 3. In fact, the thermal stresses will tend to deform the frame 3 while the

glass will not be subject to any deformation, which may mean that the adhesive seal is susceptible to deterioration, especially due to shear.

[0053] Also it is possible to provide means for compensation of thermal expansion at the level of the structural shapes 5 of the frame 3. These means may be made up of retaining rings 30, which resist traction and compression to avoid a deformation of the frame 3.

[0054] These retaining rings 30 may be metallic in the form or wires or of thermoplastic loaded with glass fibers, which are inserted at the time of extrusion of the structural shapes 5. In a general manner, these retaining rings 30 are of a material that is compatible with that of the structural shapes 5.

[0055] These retaining rings 30 are of a variable number and can be located at the four angles of the longitudinal ribs 5b as is illustrated in Figure 5.

[0056] In addition, to avoid the phenomenon of condensation, classically a desiccant material 32 is used which will be deposited on the inside of the longitudinal ribs 5b, which communicate with the cushion of insulating air 9 by way of the openings 34 arranged on the upper face of the ribs.

[0057] In the embodiment illustrated in Figure 6, the trim 25 that is mounted on each structural shape 5 of the frame 3 is produced of a single-piece structural shape 25a so that it surrounds the core 5a of the structural shape 5. The mounting of the structural shape 25a is also carried out by elastic locking or by gluing.

[0058] In a general manner, a panel 1 according to the invention can also be used to produce an opening of any type whatsoever as well as a sliding door for a picture window.

Claims

1. Double-glazed panel comprising a support part (A) formed by a frame (3) and a window pane part (B) formed by two window panes (V1, V2) held at a distance from each other by spacer means (5b) that form a unit with the frame (3) and fastened to the latter by gluing and characterized in that the adhesive used to fasten the window panes (V1, V2) to the spacer means (5b) has a rigidity modulus within a range of values from about 20 MPa to 100 MPa and a shear resistance greater than 10 MPa in such a way as to produce a panel in which the window panes (V1, V2) contribute to the rigidity of the panel.
2. Double-glazed panel according to claim 1, characterized in that the adhesive has a rigidity modulus on the order of 50 ± 10 MPa and a shear resistance greater than 12 MPa.
3. Double-glazed panel according to claim 1 or 2, characterized in that the frame (3) is produced of polypropylene.
4. Double-glazed panel according to any one of claims 1 to 3, characterized in that the adhesive used is an adhesive chosen from the polyurethane family.
5. Double-glazed panel according to claim 4, characterized in that a putty filler (22) is also mounted between the window panes (V1, V2) and the spacer means (5b) to form a sealing barrier against water vapor in order to insulate the cushion of insulating air (9).
6. Double-glazed panel according to claim 3, characterized in that the glue used has a polypropylene base.
7. Double-glazed panel according to claim 6, characterized in that an adhesive with polypropylene base also forms a sealing barrier against water vapor to insulate the cushion of insulating air (9).
8. Double-glazed panel according to any one of the preceding claims, characterized in that the adhesive is placed in the form of a bead having a thickness on the order of 1 to 2 mm.
9. Double-glazed panel according to claim 8, characterized in that this bead of adhesive is placed over a width that is on the order of a centimeter.
10. Double-glazed panel according to any one of the preceding claims, characterized in that the spacer means (5b) between the two window pains (V1, V2) is integrated in the frame (3) of the panel.
11. Double-glazed panel according to claim 10, characterized in that the frame (3) of the panel is formed using the assembly of structural shapes (5) and in that each structural shape incorporates a part of the spacer means between the two window panes (V1, V2).
12. Double-glazed panel according to claim 11, characterized in that each structural shape (5) of the frame (3) essentially has a T-shape in cross section.
13. Double-glazed panel according to claim 12, characterized in that each structural shape (5) comprises a core (5a) with an essentially rectangular cross section having four faces and a central rib (5b) projecting on one face of the core and extending over the entire length of same.
14. Double-glazed panel according to claim 13, characterized in that the central rib (5b) of each structural shape (5) has two longitudinal faces separated from each other by a distance corresponding to the desired spacing between the

two window panes (V1, V2).

15. Double-glazed panel according to claim 14, characterized in that once the frame (3) is formed, the longitudinal faces of the central ribs (5b) of the structural shapes (5) of the frame (3) delimit two contact surfaces on which the two window panes (V1, V2) are glued.
16. Double-glazed panel according to any one of the preceding claims, characterized in that the frame (3) comprises means for compensating the differences between the thermal expansion coefficients of the glass in the window panes (V1, V2) and the material of the frame (3).
17. Double-glazed panel according to claim 16, characterized in that the thermal compensation means consist of retaining rings (30) that resist traction and compression to prevent deformation of the frame (3).
18. Double-glazed panel according to claim 17, characterized in that the retaining rings (30) are made of polypropylene loaded with glass fibers or of metal wires.
19. Double-glazed panel according to any one of claims 16 to 19, characterized in that the thermal compensation means are integrated in the manufacturing of the structural shapes (5) of the frame (3).
20. Double-glazed panel according to any one of the preceding claims, characterized in that it comprises trim or esthetic elements (25) around the frame (3).
21. Double-glazed panel according to claim 20, characterized in that the trim elements (25) are made up of two flanges (26) that surround the core (5a) of each structural shape (5) of frame (3).
22. Double-glazed panel according to claim 21, characterized in that the two trim flanges (25) form a unit with the structural shapes (5) of the frame (3).
23. Double-glazed panel according to claim 21, characterized in that the two trim flanges are connected to the structural shapes (5) of the frame (3) by locking or gluing.

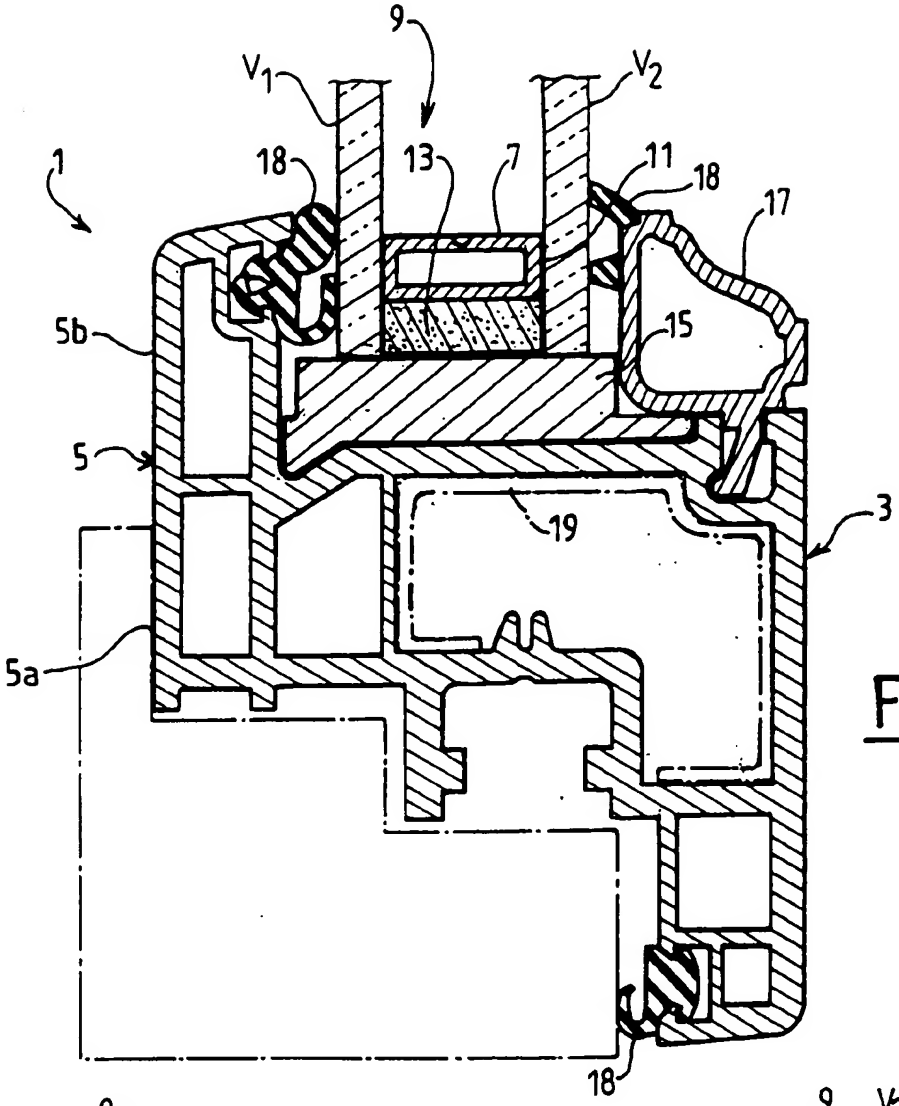

FIG.1

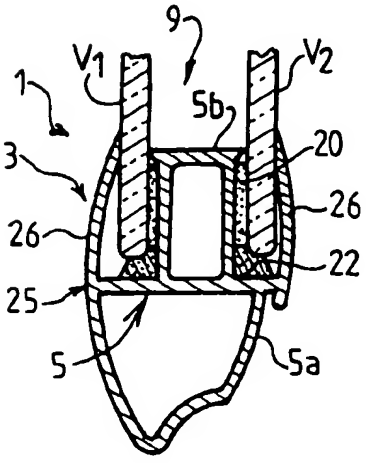

FIG.2

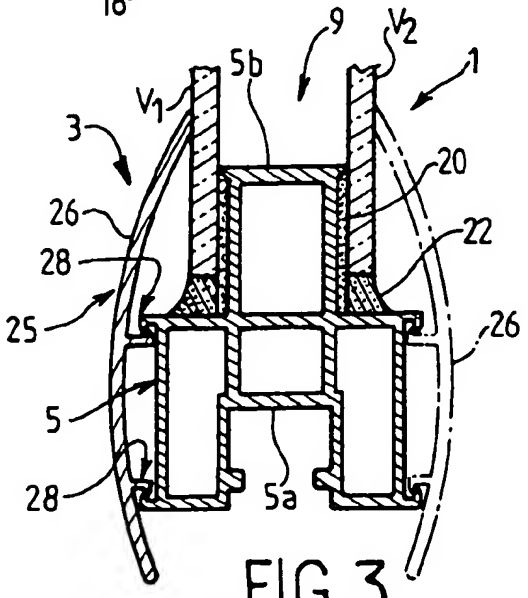

FIG.3

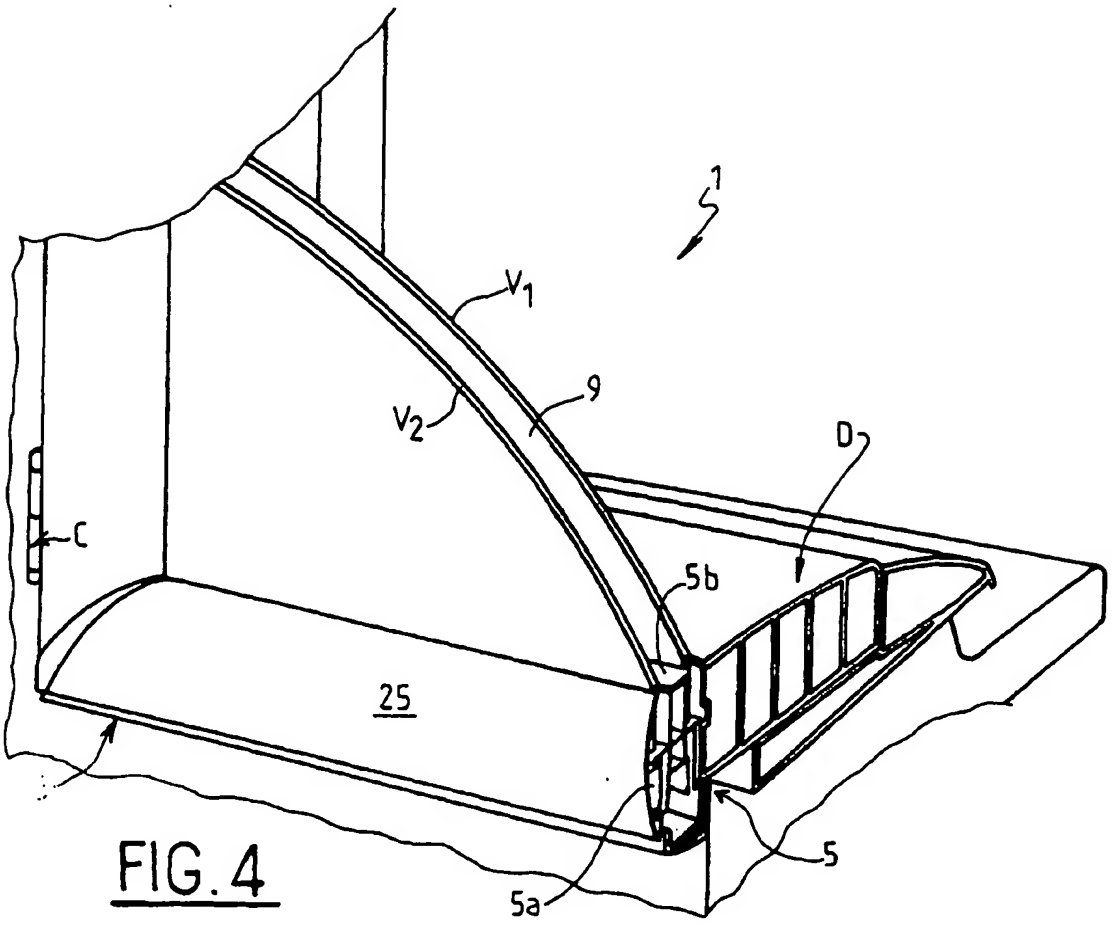

FIG. 4

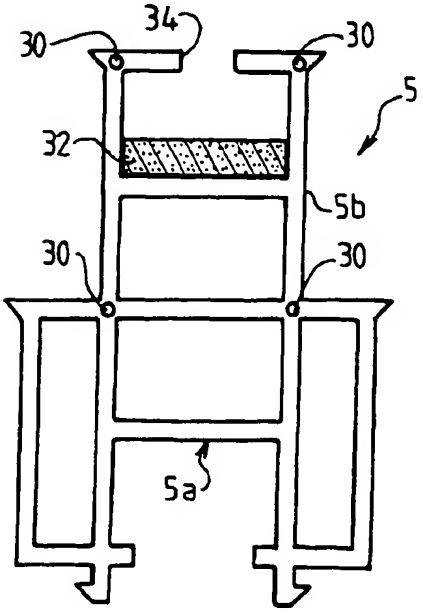

FIG. 5

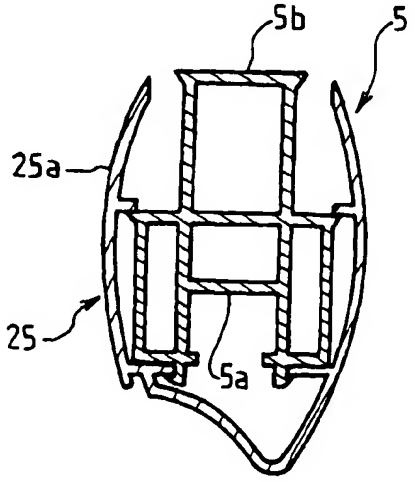

FIG. 6